

The Office of Environment, Safety and Health and its Office of Nuclear and Facility Safety (NFS) publishes the Operating Experience Weekly Summary to promote safety throughout the Department of Energy (DOE) complex by encouraging feedback of operating experience and encouraging the exchange of information among DOE nuclear facilities.

The Weekly Summary should be processed as an external source of lessons-learned information as described in DOE-STD-7501-96, *Development of DOE Lessons Learned Programs*.

To issue the Weekly Summary in a timely manner, the Office of Operating Experience Analysis and Feedback (OEAF) relies on preliminary information such as daily operations reports, notification reports, and, time permitting, conversations with cognizant facility or DOE field office staff. If you have additional pertinent information or identify inaccurate statements in the summary, please bring this to the attention of Jim Snell, 301-903-4094, or Internet address jim.snell@hq.doe.gov, so we may issue a correction.

Readers are cautioned that review of the Weekly Summary should not be a substitute for a thorough review of the interim and final occurrence reports.

Operating Experience Weekly Summary 97-31

July 25 through July 31, 1997

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EVENTS

1. INADVERTENT TRANSFER OF ACID SOLUTION TO A PROCESS TANK

On July 22, 1997, at the Savannah River Site, an operator performing a valve lineup to recirculate the contents of a tank incorrectly determined the tank inlet valve was closed when it was actually open. This condition allowed acid to transfer to a tank that was supposed to be isolated. The operator thought the valve was closed because the valve handwheel would not turn. He also presumed the valve was closed based on the previous shift's operation of the system. Investigators determined that the shift turnover was inadequate and that there were no log entries indicating the actual lineup of the system. Proper shift turnover and log entries would have indicated that operators left the valve open following a filling operation of the tank. Inadvertent transfers of solutions can result in tank overflows, mixing of incompatible chemicals or solutions, contamination of clean systems, and criticality safety implications. (ORPS Report SR--WSRC-HCAN-1997-0031)

The operator lined up the valves to circulate the contents of the tank for chemistry sampling after the tank received solution from the acid recovery unit. The tank inlet valve was a gate valve with a chain attached to the handwheel. The operator was concerned about radioactive contamination, so he avoided entry into the basin area where the valve and chain were located and attempted to close the inlet valve from a nearby catwalk. The operator reached through the catwalk railing and tried to close the valve using the handwheel chain. Because the operator pulled on the chain at the handwheel and not from down in the basin, he did not benefit from the full mechanical advantage, and the valve did not move. He interpreted the lack of movement to mean the valve was closed. An independent verifier also attempted to close the valve from the catwalk with the chain and determined the valve was closed. They reported the valve to be closed. When operators restarted the solution feed from the acid recovery unit, they noticed an increase in the liquid level of the recirculation tank. The supervisor told another operator to re-check the valve lineup, and he reported back that the tank inlet valve was open.

Investigators determined that the third operator who checked the valve position did so during daylight and was able to see that the valve stem was extended in the open position. They also determined that the valve did not have local position indication and that operators had complained of problems with area lighting at night. Investigators also determined that a week earlier operators stated that the valve required lubrication.

Maintenance personnel lubricated the valve, removed the chain from the valve handwheel, and re-lamped the basin area. Shift personnel are updating status boards for equipment lineup and using a turnover checklist to ensure complete and accurate shift turnovers.

NFS reported inadvertent solution-transfer events in Weekly Summaries 97-23, 97-08, 96-14, 96-13, 96-09, 96-01, 95-51, 95-27, 93-46, and 93-10.

- Weekly Summary 97-23 reported that on May 30, 1997, operators at the Savannah River Site inadvertently transferred solution from the wrong cation concentrate batch tank to a precipitator feed tank. An operator accidentally read steps from the wrong page of a procedure, resulting in an incorrect valve lineup. (ORPS Report SR--WSRC-FBLINE-1997-0019)
- Weekly Summary 97-08 reported that on February 12, 1997, a process specialist at the Rocky Flats Environmental Technology Site found a valve in the wrong position while sparging a tank for draining plutonium nitrate solution. The valve

was not identified in the procedure for draining the tank. (ORPS Report RFO--KHLL-771OPS-1997-0009)

- Weekly Summary 96-14 reported that on March 28, 1996, operators at the Savannah River Site inadvertently transferred hydrofluoric acid because they did not follow procedure steps in the required sequence during a valve lineup. (ORPS Report SR--WSRC-FBLINE-1996-0016)
- Weekly Summary 96-13 reported two events at the Savannah River Site, where operator inattention to detail resulted in the inadvertent transfer of nitric acid solution. On March 20, 1996, an operator failed to close the outlet valve of a head tank and inadvertently transferred 2,200 pounds of solution to a dissolver. On March 25, 1996, an operator opened a tank drain valve allowing 600 pounds of solution to inadvertently transfer to a waste header while performing a valve lineup. (ORPS Reports SR--WSRC-FCAN-1996-0005 and SR--WSRC-HCAN-1996-0009)

Inadvertent transfers create several major areas of concern. For example, solutions containing fissile materials may be subject to inadvertent criticality. Also, for many solutions, there are concerns about reactions between incompatible chemicals. These reactions may result in explosive, corrosive, or gas-generating mixtures. Another area of concern is the potential for off-site release of radiation or hazardous chemicals. A review of inadvertent transfer events reported in the Weekly Summary indicates that procedure errors and incorrect valve lineups are major causes of these events. It is important that operators understand valve design and operation. They need to ensure they are operating the correct valve and what the effect of its operation will be. If there is any doubt as to valve position or lineup, operators should stop work until those doubts have been cleared. A valve should never be "jammed" in the open position. After the valve has been fully opened, the handwheel should be turned toward the closed position one-half turn, unless the valve is designed with a backseat. This prevents the valve from freezing in the open position, making it difficult to close.

DOE 5480.19, *Conduct of Operations Requirements for DOE Facilities*, chapter XI, "Logkeeping," provides guidelines on establishing operating logs, recording information, ensuring legibility of entries, and performing reviews of logs. Chapter XII, "Operations Turnover," requires that operations shift turnovers provide the on-coming operators with an accurate picture of the overall facility status. DOE-STD 1038-93, *Guide To Good Practices For Operations Turnover*, states that effective turnovers are crucial to the safety of DOE facilities. The turnover process should ensure that on-coming personnel have an accurate picture of facility status and past and scheduled operations are reviewed. Briefings conducted near the end of each shift enhance shift turnover and operator awareness of plant status and identify needed follow-up actions. As a result, operators involved are informed and prepared to conduct a more thorough shift turnover to on-coming personnel.

KEYWORDS: operations, tank, transfer, valve

FUNCTIONAL AREAS: Operations, Chemistry

2. THIRTEEN INCORRECT UNREVIEWED SAFETY QUESTION DETERMINATIONS

On July 23, 1997, the Department of Energy (DOE) informed Los Alamos Chemistry and Metallurgy Research facility managers that operations risk analysts incorrectly determined that 13 Unreviewed Safety Question (USQ) determinations were negative instead of positive. Since 1993, facility operations risk analysts have performed more than 70 USQ determinations for on-

going and proposed operations within the facility, as well as for several existing conditions. Because the USQ determinations were misidentified, facility management unintentionally allowed certain facility operations/activities or facility modifications to commence without getting DOE approval. Proper implementation of the USQ process is important to ensure that facility operations remain within the authorization basis and are approved by DOE. (ORPS Report ALO-LA-LANL-CMR-1997-0008)

DOE representatives from the Albuquerque and Los Alamos Area Offices reviewed the facility USQ process during the first week of June 1997. They conducted the review to facilitate approval of the final safety analysis report submitted to DOE in November 1994. Because of the delay in approving the report, DOE was concerned that new operations performed in the facility following report submittal might not be adequately covered in the final safety analysis report. In mid-June, after completing a review of more than half of the USQ determinations, DOE informed facility managers that they believed seven of the USQ determinations the analysts identified as negative should have been positive. They were also concerned that the facility manager and other personnel involved in the preparation, review, and approval of USQ determinations did not have formal USQ training as required by DOE O 5480.21, *Unreviewed Safety Questions*, and Laboratory standards. Based on this finding, the DOE Los Alamos Area Office issued a memorandum to facility managers on June 19, stating that several facility operations needed to be halted until misidentified USQ issues were resolved and approved by DOE. During the week of July 14, DOE completed their review of all USQ determinations since 1993 and identified six additional USQs that should have been positive.

Chemistry and Metallurgy Research facility managers took immediate actions to address the concerns of the DOE representatives. However, more discussion between DOE and facility management representatives is required to fully understand the safety implications. Operating Experience Analysis and Feedback engineers will continue to follow this event and will provide information about the causal factors when facility managers complete their investigation.

Managers at other nuclear facilities that experience long delays in approval of their safety analysis documentation should consider reviewing any changes in facility operations or conditions that have been made or planned since document submittal to ensure these operations or conditions are bounded by the authorization basis. Managers should also ensure that personnel involved in the USQ process are formally trained.

DOE O 5480.21, *Unreviewed Safety Questions*, establishes program requirements that allow contractors to make changes to the plant and procedures that do not adversely affect or extend the safety basis that DOE has approved for the facility. It also ensures that DOE has the approval authority for changes that introduce new hazards and higher-than-approved risks to the public and facility workers. The Order states that the following three criteria are used to identify USQs when changes are made to the facility: (1) if the probability of occurrence or the consequences of an accident that is analyzed in the safety analysis report are changed; (2) if the possibility of an accident of a different type than analyzed in the report may be created; and (3) if the margin of safety, as defined in any technical specification, is reduced. Chapter III, section 8, "Training," states that all personnel responsible for performing, reviewing, or approving, USQ determinations should receive initial training on the application of the Order and facility-specific procedures. Retraining is recommended on a 2-year interval or as may be proposed by the contractor.

KEYWORDS: unreviewed safety question determination, final safety analysis report, training and qualifications

FUNCTIONAL AREAS: Licensing/Compliance, Training

3. IMPROPER STORAGE OF PLUTONIUM RESIDUE AT ROCKY FLATS

In July 1997, at Rocky Flats Environmental Technology Site, during a pre-planning meeting for a residue sampling program, task-team personnel determined two containers of plutonium residue violated the site fire safety procedure for storage of plutonium. The procedure requires containers to be stored in inert environments or in areas with heat detector systems if they have not gone through a stabilization process. The two containers have not undergone stabilization and are not stored in the required environment. Investigators later discovered that eight additional containers of plutonium residue are in violation of the site procedure. Because of this event they are looking at several hundred other containers of plutonium oxides to determine whether they are stored properly. Improper storage of plutonium oxide and residue that is not stabilized is dangerous because they are pyrophoric and generate hydrogen gas during oxidation. (ORPS Report RFO--KHLL-371OPS-1997-0060)

In 1994, the Defense Nuclear Facilities Safety Board recommended that Rocky Flats expedite processing containers of possibly unstable residues and convert constituent plutonium to a form suitable for safe interim storage. In mid-1996 a task-team was established to incorporate the Board's recommendations into a procedure. A contractor fire protection program manager analyzed the existing stockpile of plutonium oxide material and revised the procedure. In October 1996, facility managers held a fact-finding meeting with criticality safety and material handling personnel to discuss items they believed were not stored in compliance with procedures. They determined that Recommendation 94-1 was incorrectly incorporated into the requirements of Procedure HSP 31.11, "Transfer and Storage of Plutonium for Fire Safety." The revision became effective July 25, 1996. The fact-finding team members determined that the contractor fire protection program manager focused on the requirements for storing repackaged plutonium oxide and did not include guidance directing exemption of legacy plutonium oxide in the revised procedure. This was contrary to the original intent of the revision, which exempted some material from the revised procedural requirements for up to a year. Plutonium pyrophoricity experts analyzed the intent of the exemption and determined it was appropriate. Facility managers determined the procedure should be modified to allow building managers one year from July 26, 1996, to implement plans and stabilize their legacy plutonium oxide. However, the building managers did not complete the implementation of the plan.

Facility managers held a fact-finding meeting after the July 23, 1997, event. They determined that immediate corrective actions will include analyzing the storage containers to ensure they are properly classified or sampling the containers as necessary. Additional corrective actions will be based on the analysis or sampling results.

NFS reported the October 1996 events at Rocky Flats in Weekly Summary 96-43 and reported a similar Rocky Flats event in Weekly Summary 94-45.

- Weekly Summary 96-43 reported that on October 16, 1996, a building operations manager determined that 11 cans of plutonium oxide were stored in a manner that violated a new procedure requirement limiting their storage to 1 year or less. The cans had been stored for more than 4 years. On October 17, 1996, nuclear material control personnel notified a shift manager that a container of plutonium oxide material stored in a vault since 1991 violated the same requirement. (ORPS Reports RFO--KHLL-771OPS-1996-0166 and RFO--KHLL- 371OPS-1996-0136)
- Weekly Summary 94-45 reported that on November 7, 1994, nuclear materials control personnel determined that a 1-liter storage can containing fissile material had tipped in a heat detector tray, violating criticality safety requirements. (ORPS Reports RFO--GGR-PUFAB-1994-0233)

Operating Experience Analysis and Feedback (OEAF) engineers searched the Occurrence Reporting and Processing System (ORPS) database for pyrophoric storage occurrences and found 136 occurrences DOE-wide. Of the 136 occurrences found, 129 occurrences were at Rocky Flats. Rocky Flats facility managers reported that the root cause of 52 of those events was management problems. Further review showed that 21 percent of the management problems were attributed to inadequate administrative control.

These events illustrate the need for timely and effective corrective actions. Facility managers should review records and controls to ensure that staff are qualified and certified for the tasks to which they are assigned. Employees should also accept the responsibility for meeting qualification requirements.

Many containers of plutonium-bearing materials classified as "residuals" are stored at Rocky Flats, and some of these materials are potentially chemically unstable. Many of the containers also contain plutonium metal that is in contact with, or close to, plastic. The Defense Nuclear Facilities Safety Board recommended repackaging the plutonium in accordance with DOE-STD-3013-94, *Criteria for Packaging of Plutonium Metals and Oxides for Long-Term Storage*, to eliminate existing hazards and stated in Recommendation 94-1 that "additional delays in stabilizing these materials will be accompanied by further deterioration of safety and unnecessary increased risks to workers and the public."

These events emphasize the importance of taking timely and effective corrective actions. DOE contractors operating nuclear facilities, who fail to implement corrective actions for identified deficiencies, could be subjected to Price-Anderson civil penalties under the work processes and quality improvement provisions of 10CFR830.120, "Quality Assurance Requirements." These actions include Notices of Violation and, where appropriate, non-reimbursable civil penalties. The primary consideration for determining whether DOE takes enforcement action is the actual or potential safety significance of the violation, coupled with how quickly the contractor acts to identify and correct problems. DOE STD-7501-95, *Development of DOE Lessons Learned Programs*, discusses management's responsibility for incorporating appropriate corrective actions in a timely manner.

DOE-HDBK-1081-94, *Primer on Spontaneous Heating and Pyrophoricity*, provides information on properties, storage and handling, process hazards, and fire extinguishing methods for combustible metals. Plutonium reacts at an accelerated oxidation rate when heated to its ignition temperature. Finely divided metal and turnings ignite readily and achieve a high initial temperature that lasts until melting occurs and the surface is reduced. Many plutonium fires have occurred because samples containing finely divided metal spontaneously ignited. Plutonium fires should not be approached without protective clothing and respirators unless the fire is enclosed in a glove box. The most effective agent for extinguishing plutonium fires is magnesium oxide sand. Using water to extinguish the fire is acceptable if criticality safety considerations are not a concern.

KEYWORDS: fire protection, storage, combustible

FUNCTIONAL AREAS: Fire Protection, Materials Handling/Storage

4. SUBCONTRACTOR USES INADEQUATE LOCKOUT FOR ELECTRICAL WORK

On July 22, 1997, at the Savannah River Site, a subcontractor mechanic used a non-documented lockout/tagout (allowed only for isolation of a single energy source) to lockout a cabinet that had more than one electrical feed. The mechanic installed the lockout to de-energize a 480-volt electrical source while troubleshooting and repairing a laboratory heating, ventilation, and air conditioning system. While the mechanic was working on the system, an auditor from Central Services Works Engineering discovered that the cabinet contained an energized 120-volt electrical feed in addition to the 480-volt source. The mechanic immediately stopped work, notified a custodian, removed his lock, and assisted in identifying the source of the 120-volt feed. A documented lockout should have been used because multiple sources of electrical energy were inside the same cabinet, but work planners failed to identify the other source. To ensure positive isolation of energized circuits and minimize electrical shock hazards to personnel, lockouts and tagouts must be thoroughly researched and planned. (ORPS Report SR--WSRC-TNX-1997-0005)

The facility manager conducted a critique of the event on July 24, 1997. Critique members determined that the work planners did not review as-built electrical drawings that showed the presence of the 120-volt electrical source and did not perform a walk-down of the cabinet to identify any additional hazards before turning the job over to the mechanic. Work planners will prepare two separate work clearance permits, one to conduct troubleshooting and one for repair.

NFS reported inadequate lockout/tagout events in Weekly Summaries 97-03, 96-50, 96-27, and 96-06.

- Weekly Summary 97-03 reported that on January 8, 1997, at the Savannah River Tritium Facility, a lockout coordinator mistakenly used a pre-existing lockout and did not provide electrical isolation for work on an uninterruptible power supply panel. Electricians cut a hole in the panel and installed conduit in an area where exposed, energized, 208-volt wiring existed. (ORPS Report SR--WSRC-TRIT-1997-0001)
- Weekly Summary 96-50 reported that on December 5, 1996, at the Savannah River In-Tank Precipitation Facility, a mechanic lifted and taped an incorrect lead while installing a lockout. A construction worker identified the incorrect lifted and tagged lead while conducting a zero energy check. Investigators determined the lockout/tagout package did not adequately describe the circuit to be de-energized. (ORPS Report SR--WSRC-ITP-1996-0042)

These events underscore the need for personnel who prepare lockout/tagouts to completely understand lockout requests and to ensure that the lockout/tagout addresses all isolation boundaries. It is also important for the worker to verify these boundaries and perform a zero energy check. DOE-STD-1030-96, *Guide to Good Practices for Lockouts and Tagouts*, states that every isolation from an energy source must be verified. The initial verification should include a review of pertinent controlled drawings or manuals and a hands-on check of the equipment to help identify obscure sources of power. Section 4.1.4, "Exceptions to Lockout/Tagout Requirements," addresses the use of non-documented lockout/tagouts. Both DOE-STD-1036-96 and OSHA 1910.147, *The Control of Hazardous Energy (Lockout/Tagout)*, state that lockout/tagout need not be documented for a particular machine or equipment when all of the following elements exist: (1) the machine or equipment has no potential for stored or residual energy or reaccumulation of stored energy after shutdown which could endanger personnel; (2) the machine or equipment has a single energy source which can be readily identified and isolated; (3) the isolation and locking out of the energy source will completely de-energize and deactivate the machine or equipment; (4) the machine or equipment is isolated from that energy source and locked out during the servicing or maintenance; (5) a single lockout

device will achieve a locked-out condition; (6) the lockout device is under the exclusive control of the authorized worker performing the servicing or maintenance; (7) the servicing or maintenance does not create hazards for other workers; and (8) there have been no accidents involving the unexpected activation or reenergization of the machine or equipment during previous maintenance.

Facility managers should review DOE/EH-0540, Safety Notice No. 96-05, "Lockout/Tagout Programs." The notice summarizes lockout/tagout events at DOE facilities, provides lessons learned and recommended practices, and identifies lockout/tagout program requirements. The section on "Significance of Events," states that there were 2 deaths, 1,661 lost work days, and more than \$3.5 million in property damage reported in the Computerized Accident/Incident Reporting System as a result of lockout/tagout events. The Department of Labor estimates that compliance with the lockout/tagout standards in 29 CFR 1910.147 would prevent about 120 fatalities, 28,000 serious injuries, and 32,000 minor injuries each year. Safety Notice 96-05 can be obtained by contacting the Info Center, (301) 903-0449, or by writing to ES&H Information Center, U.S. Department of Energy, EH-72/Suite 100, CXXI/3, Germantown, MD 20874. Safety Notices are also available on the Operating Experience Analysis and Feedback Home Page at http://tis.eh.doe.gov:80/web/oeaf/lessons_learned/ons/ons.html.

KEYWORDS: lockout and tagout, electrical maintenance, work planning

FUNCTIONAL AREAS: Electrical Maintenance, Work Planning

5. ELECTRICIAN SHOCKED DURING OUTLET INSTALLATION

On July 23, 1997, at the Hanford Reprocessing Facility, an electrician received a mild electrical shock while installing a new 120-volt electrical outlet in an electrical box. Investigators determined the circuit was locked and tagged-out and the electrician performed a safe condition check before he began work. After he received the shock he stopped work. Electrical personnel traced the circuit and found a jumper in the circuit. This circuit also fed a remote manipulator that also received power from a second 120-volt circuit. Electrical personnel determined there was feedback from the second 120-volt circuit for the remote manipulator and the jumper to the circuit the electrician was working on. Investigators also determined that the instrument used for the safe condition check required a current in the circuit to function, and little or no current was present. Investigators found no documentation indicating who installed the jumper or when it was installed. The undocumented modification resulted in an electrical hazard that could have caused serious injury. (ORPS Report RL--PHMC-324FDP-1997-0008)

The facility manager convened a critique to review this event. Critique members determined that plant drawings did not show the jumper installation. Critique members also determined that inspectors performed a system walk-down before issuing the lockout/tagout documentation, but they could not see the jumper because it was inside a receptacle. Facility procedures do not require opening electrical boxes, receptacles, or other systems when performing system walk-downs. Corrective actions include having electrical engineers perform detailed system walk-downs to document the facility configuration and use two voltage testers to perform electrical safe condition checks (one that detects voltage with little or no current and one that detects voltage with current).

NFS reported electrical related events in Weekly Summaries 97-18, 97-15, 97-13, 97-04, 97-03, and several 1996 Weekly Summaries.

- Weekly Summary 97-15 reported that on April 2, 1997, at the Hanford Tank Farms, an electrician inadvertently activated two radiation alarms and shut down a building exhauster when he opened a circuit breaker that was identified as the power supply for some heat-tracing tape. Investigators determined that mislabeled equipment and inaccurate drawings resulted in the exhauster being inadvertently shut down. (ORPS Report RL--PHMC-TANKFARM-1997-0035)
- Weekly Summary 97-04 reported that on January 11, 1997, an electrician at Hanford received minor flash burns when he reconnected energized, 480-volt power leads to a motor control center main breaker. The electrician and a co-worker believed the circuit was de-energized based on their interpretation of electrical system drawings and an earlier zero energy verification. The electrician received only minor burns because he was wearing the required protective clothing. (ORPS Report RL--PHMC-S&W-1997-0001)
- Weekly Summary 96-45 reported that on October 29, 1996, at Los Alamos National Laboratory, a pipefitter received a mild electrical shock while making emergency repairs to a small heating boiler. He received the shock when he tried to remove a screw securing a metal cover over the boiler ignition circuitry. An electrician inspected the boiler and discovered that a 120-volt wire from a transformer was tied to the 24-volt boiler controller. Investigators found no documentation indicating who made the wiring modification or when or why it was made. (ORPS Report ALO-LA-LANL-MEEFAC-1996-0001)

Operating Experience Analysis and Feedback (OEAF) engineers reviewed the Occurrence Reporting and Processing System (ORPS) database and found 227 events DOE-wide where contributing causes were attributed to drawing, specification, or data errors. Procedure problems represented 25 percent of the direct causes. This illustrates that accurate procedures provide an effective barrier.

This event underscores the importance of accurate drawings, correctly labeled panels, and a disciplined configuration management program. When facility managers become aware that facility drawings and panel labeling may be incomplete or inaccurate, additional safety steps should be incorporated into work controls and maintenance activities. DOE-STD-1073-Pt.1 and -Pt.2, *Guide for Operational Configuration Management Program*, states that physical configuration assessments or walk-downs should be performed for representative sample structures, systems, and components within the facility to determine the degree of agreement between the physical configuration and the configuration on the facility documentation. Physical walk-downs should be included as part of programmatic initial, post-implementation, and periodic effectiveness assessments. Facility managers should verify that these assessments include electrical drawings and system configuration, as well as mechanical system drawings. DOE 5480.19, *Conduct of Operations Requirements for DOE Facilities*, chapter VIII, "Control Of Equipment and System Status," states that DOE facilities are required to establish administrative control programs to handle configuration changes resulting from maintenance, modifications,

and testing. Paragraph C.9, "Temporary Modifications," specifies that administrative control systems should be established for installation of electrical jumpers, lifted leads, pulled circuit boards, disabled annunciators/alarms, mechanical jumpers/bypasses, temporary set-point changes, installed or removed filters or strainers, plugged floor drains, and temporary pipe supports.

DOE/ID-10600, *Electrical Safety Guidelines*, prescribes electrical safety standards for DOE field offices and facilities. Included in the guidelines is information on training and qualifications, work practices, protective equipment, insulated tools, and recognition of electrical hazards. In July 1996, prompted by the recurrence of incidents across the DOE complex involving actual or potential electrical shock incidents, the Office of Defense Programs issued a safety information letter, SIL 96-03, "Electric Shock." This publication describes nine representative events chosen to illustrate the hazards of unexpected exposure to electricity. DOE facility managers, facility representatives, and contractor facility managers should continue to emphasize the dangers and life-threatening characteristics of uncontrolled electricity.

KEYWORDS: electrical, lockout and tagout, electrical shock

FUNCTIONAL AREAS: Electrical Maintenance, Work Planning